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THAUMATOMYIA ELONGATULA (BECKER) (CHLOROPIDAE) AND *LEUCOPIS ANNULIPES* ZETTERSTEDT (CHAMAEMYIIDAE): TWO DIPTERA PREYING ON *PHLOEOMYZUS PASSERINII* (SIGNORET) (HOMOPTERA: PHLOEOMYZIDAE) IN ITALY

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Abstract.—A report is made of the discovery of *Thaumatomyia elongatula* (Becker) (Diptera: Chloropidae) and *Leucopis annulipes* Zetterstedt (Diptera: Chamaemyiidae) in coastal central Tuscany preying on the aphid *Phloeomyzus passerinii* (Signoret) (Homoptera: Phloeomyzidae) that attacks the trunk and branches of poplar trees. The biology *of Thaumatomyia elongatula* was previously unknown. To date this species is the only chloropid of the genus *Thaumatomyia* found feeding on aphids living on tree trunks and branches. All other *Thaumatomyia* species feed only on Pemphigidae that live on plant roots. A brief description of terminalia, third instar larvae and puparia of *Thaumatomyia elongatula* and *Leucopis annulipes* is also given here.

Key Words: Diptera, Chloropidae, Chamaemyiidae, *Thaumatomyia, Leucopis,* aphid predators.

Chloropidae larvae have varied food habits. Most are phytophagous or saprophagous, but some are predaceous such as those of the genus *Thaumatomyia* Zenker (Sabrosky 1987). *Thaumatomyia* larvae were long considered phytophagous, but as early as 1918 Parker showed that *Chloropisca* (= *Thaumatomyia*) *glabra* Meigen was the most effective insect enemy in Montana of *Pemphigus betae* Doane that infests the roots of sugar beet. Subsequently many authors in America, Europe and Asia showed that species of the genus *Thaumatomyia* prey on various species of Pemphigidae infesting the roots of cultivated and wild plants (Mesnil 1933, Balachowsky and Mesnil 1935, Aczél 1940, Dunn 1960, Harper 1963, Minoranskii 1966, Kamalov 1974, Petrukka and Gres' 1974, Yarkulov 1975, Grigorov 1977, Alleyne and Morrison 1978, Fedorenko 1985, Summers and Newton 1989). Only Andersson (1977) reports that the larvae of *Thaumatomyia* species "prey on root-living aphids and coccids."

This report is the first record of *Thaumatomyia elongatula* (Becker) preying commonly on *Phloeomyzus passerinii* (Signoret) (Homoptera: Phloeomyzidae), which lives in cracks of poplar tree bark and attacks the trunk and branches of poplar. On the same host and in the same period I also found the larvae of *Leucopis annulipes* Zetterstedt (Diptera: Chamaemyiidae). It is known that Chamaemyiidae larvae prey on Aphidoidea and/or some groups of Coccoidea (Tanasijtshuk 1986, McAlpine 1987, Raspi 1990, Raspi and Bertolini 1993).

Phloeomyzus passerinii is known from Great Britain, France, Spain, Morocco, Egypt, Italy, Germany, Russia, and Pakistan and lives on several species of *Populus* sp.,

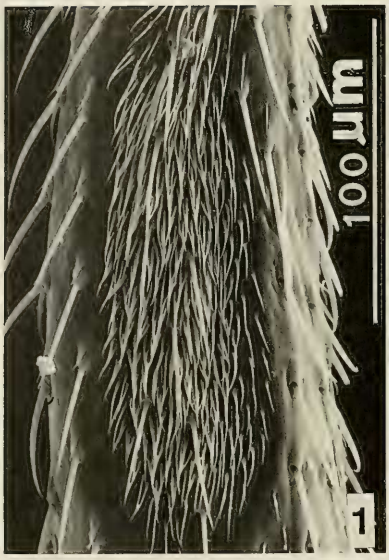


Fig. 1. *Thaumatomyia elongatula,* tibial organ, located on the posterodorsal side of hind tibia.

including *Populus alba* L., *P. nigra* L., and *P. canadensis* Moench. In Italy this aphid usually develops anholocyclically as apterous virginoparous females. It completes 12 generations per year in the field and overwinters as a neanid (Arzone and Vidano 1984). *Phloeomyzus passerinii* is located in the cracks of poplar bark and attacks the trunk, branches and emerging roots of poplar trees. In heavy infestations the trunk and branches of poplar trees appear covered by waxen threads produced by the aphid.

Thaumatomyia elongatula (Becker), 1910

Taxonomy

Species now in the genus *Thaumatomyia* Zenker 1833 were originally described in *Chloropisca* Loew 1866. Sabrosky (1943) was the first to synonymize *Chloropisca,* and subsequent authors have followed his synonymy. Andersson (1977) considered *Chloropisca* as a subgenus of *Thaumatomyia,* but confirmed that the differences are small and that the male genitalia of *Chloropisca glabra* (Meigen) are well within the range of variation of *Thaumatomyia* (s. str.) species.

Becker (1910) based his description of *Thaumatomyia elongatula* on one specimen in the Bezzi collection collected at Sondrio (Italy) and one specimen from Corsica in Schnuse's collection. It is worth mentioning that the specimen of *Chloropisca elongatula* from Sondrio (6/IX/99), a male, is in the Bezzi Collection of the Museum of Natural History in Milan.

Distribution

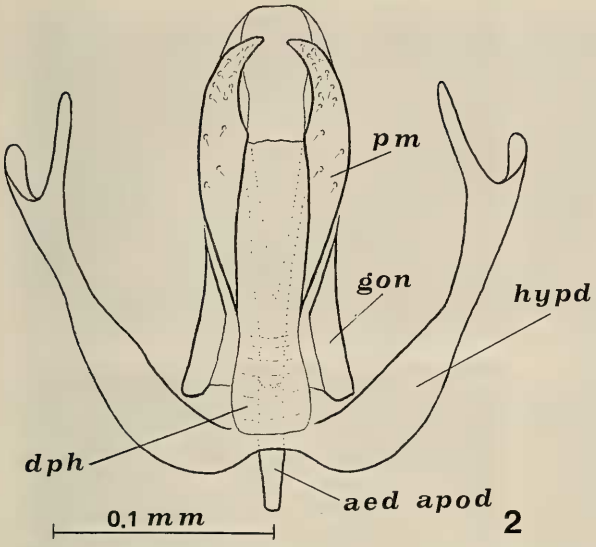
This species has been reported from France, Italy, Austria, Hungary, Germany, Russia, Ukraine, Moldavia (Becker 1910, Duda 1933, Nartshuk 1984). Its hosts were unknown until now.

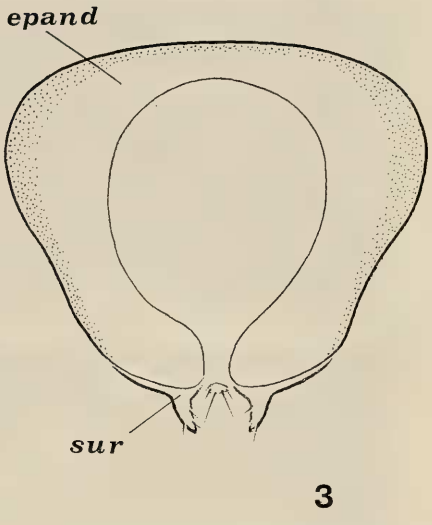
Description

Adult.—Length about 2.3 mm. Characterized by the shape of the third antennal segment that is longer than wide. A large, elongate oval area with dense short hairs (called tibial organ) is present on posterodorsal side of hind tibia (Fig. 1). For more certain identification a description of male terminalia is given for the first time.

Hypandrium parabolic in ventral view, with wide bend at top. Aedeagus almost cylindrical with long distiphallus reaching hypandrium. Subtriangular parameres narrow and extend more than half-way down aedeagus, with numerous small bristles. Gonopods almost triangular and short (Fig. 2). Male terminalia also characterized by epandrium that is subtrapezoidal with dorsal part 1.8 times as wide as basal part, and middle lobe of surstyli with hook-shaped apex (Fig. 3).

Third instar larva.—Facial mask characterized by smooth oral lobes, without oral ridges. Integument of full-grown larvae (about 4.5–5 × 0.8 in size) smooth, with lines of small spicules present only ventrally; whitish pale yellow and transparent, allowing the greenish gut to be seen. Anterior spiracles fan-shaped with seven digits. Posterior spiracles smooth, cone-shaped, as long as the base is wide, each with three elongate lobes at top with a lon-





Figs. 2, 3. *Thaumatomyia elongatula.* 2, Male terminalia in ventral view. 3, Schematic outline of the epandrium in posterior view. Abbreviations: dph = distiphallus, epand = epandrium, gon = gonopod, hypd = hypandrium pm = paramere, sur = surstylus.

gitudinal apical opening. Cephalopharyngeal skeleton (Fig. 4) (length 0.3 mm) black and brown, with strong mouth hooks, and a hooked portion with an accessory tooth and more sclerotized base of roughly rectangular shape. Hypopharyngeal sclerite H-shaped with a strong ventral bridge and not fused with tentoropharyngeal sclerite; a pair of slender sclerotized rods (parastomal bars) present above the hypopharyngeal

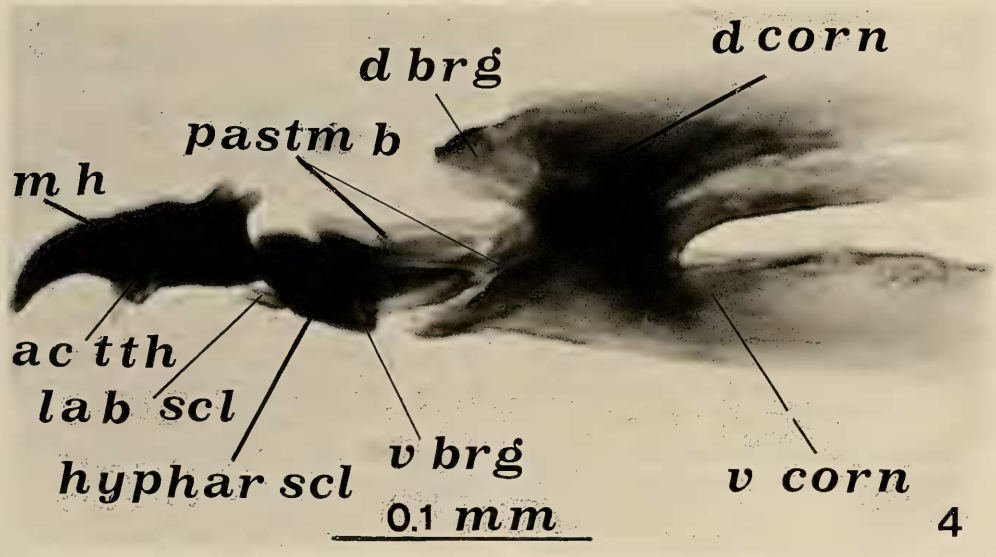
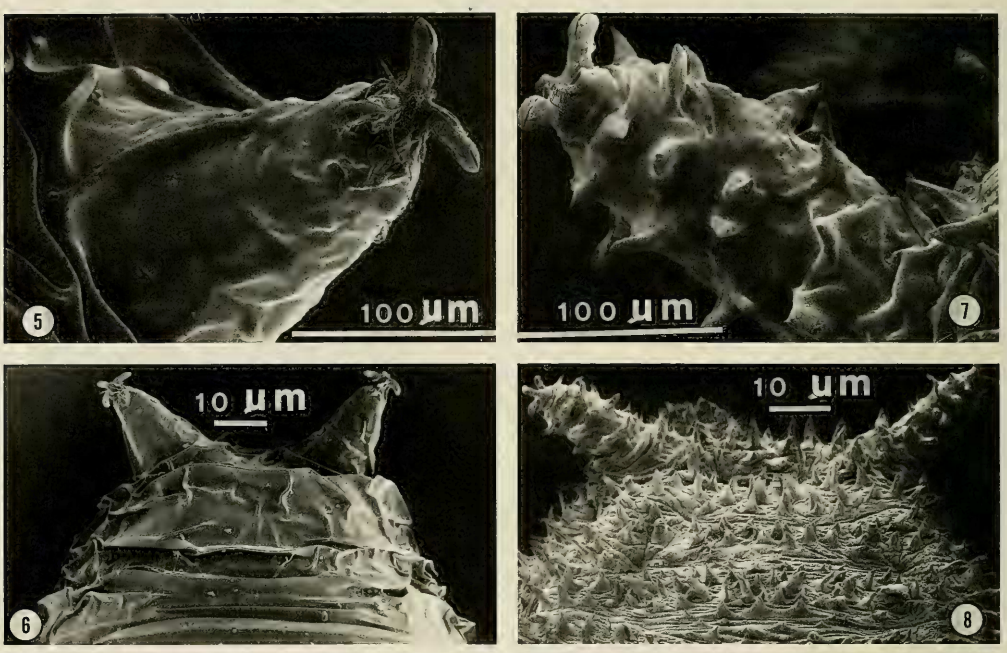


Fig. 4. *Thaumatomyia elongatula,* cephalopharyngeal skeleton. Abbreviations: ac tth = accessory tooth, d brg = dorsal bridge, d corn = dorsal cornu, hyphar scl = hypopharyngeal sclerite, lab scl = labial sclerite, m h = mouth hook, pastm b = parastomal bar, v brg = ventral bridge, v corn = ventral cornu.



Figs. 5–8. 5, *Thaumatomyia elongatula,* detail of posterior spiracular process (in puparium) bearing at apex three elongate spiracular lobes. 6, *T. elongatula,* posterior part of puparium with two characteristic smooth spiracular protuberances. 7, *Leucopis annulipes,* detail of posterior spiracular process (in puparium) bearing at apex three reniform spiracular lobes. 8, *L. annulipes.* Posterior part of puparium with two characteristic spiracular protuberances.

sclerite. Tentoropharyngeal sclerite weakly sclerotized and joined anterodorsally with prominent dorsal bridge.

Puparium.—(Figs. 5, 6) (size about 2.8 × 0.9 mm). Creamy light-brown and surface characterized by transverse folds of integument. The two characteristic posterior spiracular protuberances of the third instar are clearly visible.

Biology

In the coastal area of the province of Pisa, in 1990–1993, poplar groves (in particular the hybrid *Populus* × *euramericana* (Dode) Guinier I-214), as well as old isolated poplars in urban plantations were occasionally found to be strongly infested by the *P. passerinii.* From the beginning of June the trunk and branches of poplar trees were covered by waxen threads produced by the aphid. At this time, many different predators such as Syrphidae and Coccinellidae were present in bark cracks among the aphid colonies. Arzone (1987) has reported about 30 species of predators of *Phloemyzus passerinii* and among these, a *Thaumatomyia* (*Chloropisca*) sp.

Thaumatomyia elongatula adults were present from the beginning of June, resting on poplar tree trunks during the period when the population of *Phloeomyzus passerinii* is at greatest density. The white eggs (about 0.5 mm in length), of *T. elongatula,* are laid singly on the edge of cracks in the trunk and branches. Larval feeding habits are similar to those of aphidiphagous Syrphidae and Chamaemyiidae larvae, with the difference that *T. elongatula* larvae feed on aphids by slipping into grooves of the bark where aphids are found. Puparia can be found sticking to an outgrowth of bark, near the crack in the trunk where the larvae last fed or in the outgrowth at the base of the insertion of branches. Adults emerge from

puparia until mid July, after which one no longer finds *T. elongatula* larvae, puparia or adults. This coincides with the fall in density of the *P. passerinii* population. In the area studied, the fall in aphid population is very probably related to climatic conditions (high temperature and low humidity) and the action of the numerous entomophages.

Leucopis annulipes Zetterstedt, 1848

Taxonomy

McAlpine (1967) redescribed *L. annulipes,* discussed its identity and designated a lectotype.

Distribution and Hosts

Leucopis annulipes is widespread in Europe and Asia (Tanasijtshuk 1986) and has been recorded from Sweden, Poland, France, Italy (Raspi 1995), Hungary, Bulgaria, Russia, Ukraine, Moldavia, Georgia, Armenia, Kazakhstan, Turkmenistan, Uzbekistan, Tadzhikistan, Kirghizia and Iran. *Leucopis annulipes* is also widespread in Italy and in particular is very common on the host *Phloeomyzus passerinii.* Many specimens are present in some collections but frequently wrongly identified.

Leucopis annulipes larvae are polyphagous and prey on aphids as reported by Tanasijtshuk (1986), in particular on many genera of Aphididae and also Chaitophoridae (*Chaitophorus niger* Mordvilko), Pemphigidae (*Eriosoma lanigerum* (Hausmann)), and Phloeomyzidae (*Phloeomyzus passerinii*).

Description

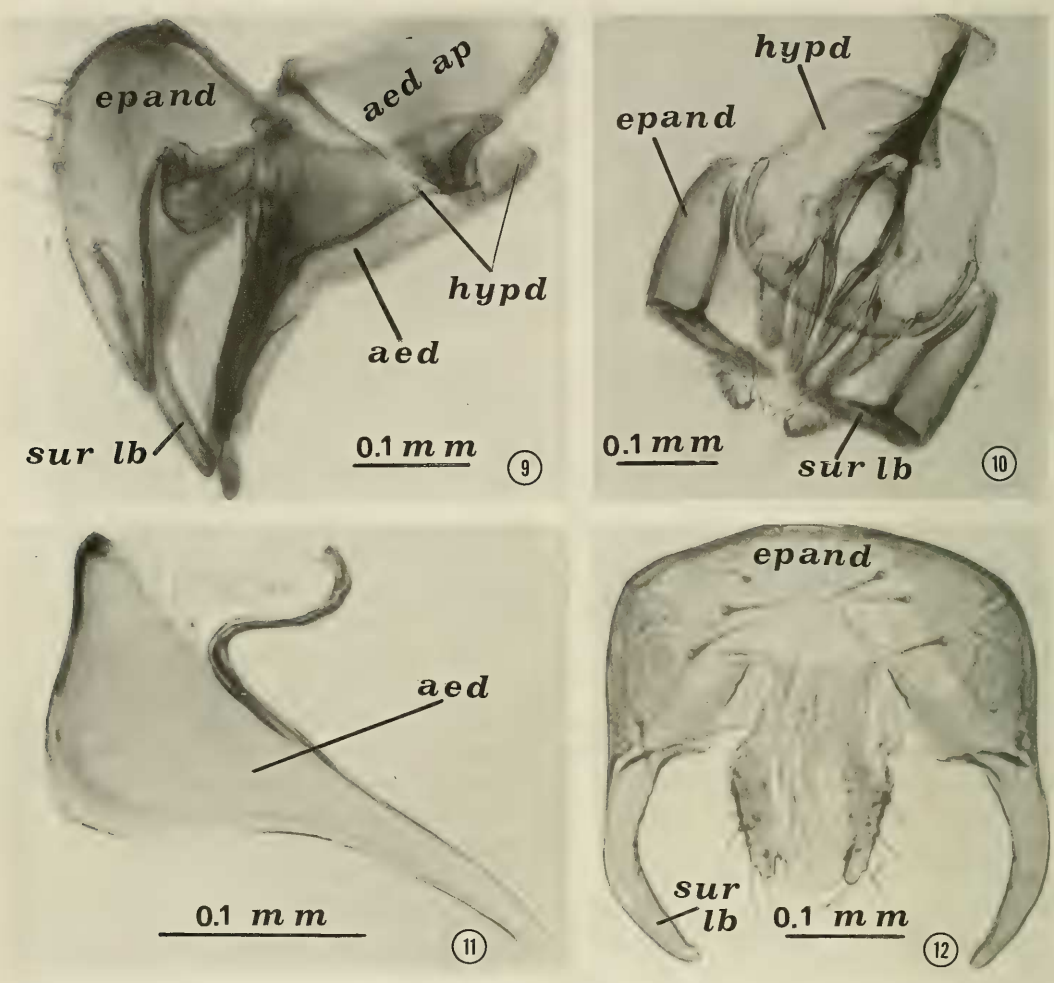
Adult.—Length about 2.5 mm. Generally silvery grey, with blackish antennae and palpi. Male frons with prominent, characteristic, felty pad enclosing anterior ocellus. McAlpine (1967) made a careful description of the male lectotype of *L. annulipes* and made drawings of the head, thorax, abdomen and male terminalia. Both sexes are generally similar, but the ocellar triangle is less prominent in the female. Only the study of male and female terminalia, however, makes it possible to identify this species with certainty. To insure correct identification of *L. annulipes,* a brief description of male and, for the first time, female terminalia is given here.

Male terminalia (Figs. 9–12) characterized by a compressed aedeagus, compact in lateral view. From base to midlength, aedeagus fairly wide, then narrows and curves slightly downwards to end in a pointed tip (Fig. 11). Epandrium and surstylar lobes with very distinctive shape; long and narrow in lateral view and strongly inwardly curving from posterior and ventral view (Figs. 9, 10, 12).

Ovipositor relatively short (Figs. 13–14). Sixth sternite large, of approximately rectangular shape, with base 2.3 times as wide as high and with numerous setulae in second half of sternite; this sternite appears much less heavily sclerotized in marginal areas of first half of sternite. Lateral margin of sixth tergite sinuous. Base of sixth sternite 1.5 times as wide as base of fifth. Fifth sternite almost trapezoidal with numerous setulae distributed roughly along three lines parallel to base; this sternite appears much less heavily sclerotized in marginal areas. Seventh sternum with two small, variably-shaped, but frequently almost equilaterally triangular sclerites with one apex turned distally. Seventh tergum membranous. Tergum of eighth segment only weakly sclerotized. Two pairs of strongly sclerotized spherical spermathecae present.

The shape of the surstylar lobes and the frons of the male with its prominent felty pad are the two most important characteristics of this species, together with the larval morphology. Rondani (1847) was first to note that adults of *Leucopis* species are very similar and that larvae are important for discrimination among species.

Third instar larva.—Facial mask characterized by smooth oral lobes. Full-grown larva (size about 4.2–4.5 × 1.1) whitish-pink and transparent, with dark gut visible. Integument, dorso-laterally, presents numerous spines that are short and flat at their



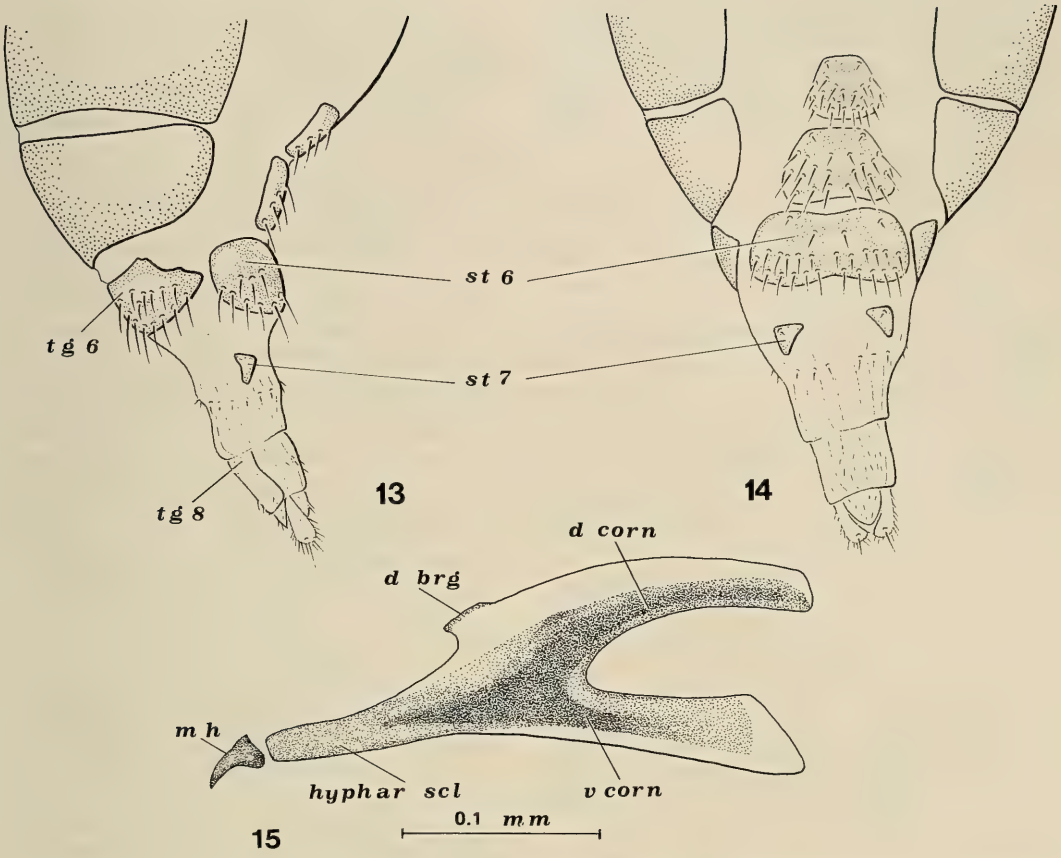
Figs. 9–12. *Leucopis annulipes*. 9, Microphotograph of male terminalia in lateral view. 10, Microphotograph of male terminalia in ventral view. 11, Aedeagus in lateral view. 12, Epandrium in posterior view. Abbreviations: aed = aedeagus, aed apod = aedeagal apodeme, epand = epandrium, hypd = hypandrium, sur lb = surstylar lobe.

base and very small ventrally. Anterior spiracles usually with four digits. Posterior spiracular protuberances typically surrounded by about four lines of spines, each spiracle characterized by three reniform lobes with a longitudinal apical opening. Cephalopharyngeal skeleton (Fig. 15) (length about 0.3 mm) black and brown, with small mouthhooks; hypopharyngeal sclerite elongate, weakly sclerotized, and fused with tentoropharyngeal sclerite. Hypopharyngeal bridge membranous. Tentoropharyngeal sclerite strongly sclerotized only centrally and in dorsal cornua, and joined anterodorsally with a prominent, weakly sclerotized dorsal bridge.

Puparium.—Figs. 7, 8 (Size about 2.4–3.6 × 0.9–1.2) reddish brown and similar in shape to larva, but body slightly flattened, with two longitudinal laterodorsal prominent ridges.

Biology

In the coastal area of Tuscany (province of Pisa), poplar groves, as well as old isolated poplar trees in urban plantations, were



Figs. 13–15. *Leucopis annulipes.* 13, Female teminalia in lateral view. 14, Female terminalia in ventral view. Abbreviations: st = sternite, tg = tergite. 15, Cephalopharyngeal skeleton. Abbreviations: d corn = dorsal cornu, hyphar scl = hypopharyngeal sclerite, m h = mouth hook, v corn = ventral cornu.

sometimes found to be strongly infested by *P. passerinii. Leucopis annulipes* larvae were commonly found on trunks among aphid colonies. Puparia can be found sticking to an outgrowth of bark, near the crack in the trunk where the larvae last fed. Adults emerge from puparia until mid July, after which, it is no longer possible to find *L. annulipes* on the host in the area studied.

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